Chapter 11 Notes

The exam on Chapter 11 will cover sections 11.1-11.10, with the exception of 11.3 (The Integral Test), and other places that use the integral. We will come back and pick these up later. No calculators will be allowed for this exam- It should take approximately 50 minutes to complete.

Here are the main points from this material:

1. Know these definitions: A sequence, series, absolute (and conditional) convergence, radius of convergence, interval of convergence, Taylor series, Maclaurin series.

2. Be able to determine if a sequence converges or diverges. This means that we can find the limit. The main techniques we reviewed were:

   (a) L'Hospital's Rule (and the algebra needed to get into a form suitable for L'Hospital)

   (b) Divide by a power of n

   As for the limit laws (and the Squeeze Theorem), you should know when you can apply them, but I won't ask you to state them.

   NOTE: You can use your intuition so that you know what you're trying to get, but for full credit, you must back up your answer with a valid technique, as one of the two listed above.

3. Understand and be able to explain the meaning behind a series- In particular, what does it mean to say that we can sum an infinite number of things together? (If you're not sure what I mean, see the top of p. 705 and the discussion before and after the definition.)

4. Template Series: The geometric series (and the sum of the geometric series), the $p-$series, and in particular the harmonic series and the alternating harmonic series.

   Know how we derived the sum of a geometric series.

5. Template Maclaurin Series: e^x, $\sin(x)$ and $\cos(x)$, $\frac{1}{1-x}$.

   Notice the last one is the geometric series.

6. Be able to determine if a series converges or diverges:

   (a) Test for Divergence.

   (b) (For positive series or abs conv) The (direct or limit) comparison test.

   (c) (For abs convergence) The Ratio Test

   (d) (For abs convergence) The Root test (not a common test)

   (e) The Alternating Series Test and the remainder estimate for an alternating series, R_n

   NOTE: You can use your intuition so that you know what you're trying to get, but for full credit, you must back up your answer with a valid technique (like those listed above).

7. The only sum estimation we'll need to recall is the one for the alternating series, page 730, and understand Example 4.

8. Find the radius and interval of convergence for a given power series. Understand the three possible outcomes for the radius.

9. Construct a power series for a given function using a geometric series as a template (like in 11.9).

10. Construct the Taylor (or Maclaurin) series for a given function using the formula.

11. For this exam, you won't need to know the remainder estimates for the Taylor/Maclaurin series, or the statement of the binomial theorem.

12. Background skills from Calculus I: Be able to compute a limit (algebraically and/or using l'Hospital's rule), recall how to differentiate a product, a quotient, and the usual set of functions.

    Derivative formulas are included below. I won't ask you for these explicitly, but for various techniques in Chapter 11, you'll need to differentiate.

f	f'
cf	cf'
$f \pm g$	$f' \pm g'$
fg	$f'g + fg'$
$f(g(x))$	$f'(g(x))g'(x)$
$\frac{f}{g}$	$\frac{f'g - fg'}{g^2}$
$f(x)^{g(x)}$	Use log diff.

f	f'
c	0
x^n	nx^{n-1}
e^x	e^x
a^x	$a^x \ln(a)$
$\ln\|x\|$	$\frac{1}{x}$

f	f'
$\sin(x)$	$\cos(x)$
$\cos(x)$	$-\sin(x)$
$\tan(x)$	$\sec^2(x)$
$\sec(x)$	$\sec(x)\tan(x)$
$\csc(x)$	$-\csc(x)\cot(x)$
$\cot(x)$	$-\csc^2(x)$
$\sin^{-1}(x)$	$\frac{1}{\sqrt{1-x^2}}$
$\tan^{-1}(x)$	$\frac{1}{1+x^2}$